



# STGP20NB60K

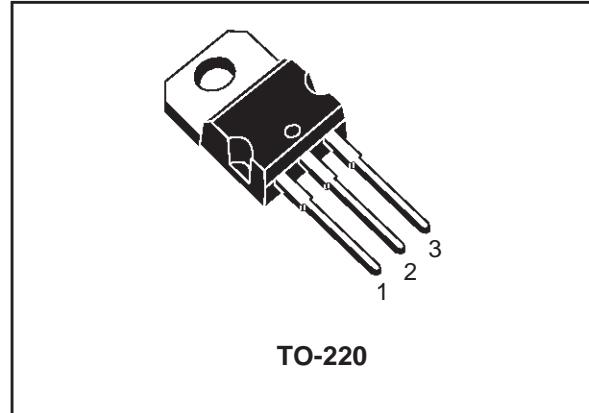
## N-CHANNEL 20A - 600V - TO-220

### PowerMesh™ IGBT

PRELIMINARY DATA

TYPE	V <sub>CES</sub>	V <sub>CES(sat)</sub>	I <sub>C</sub>
STGP20NB60K	600 V	< 2.8 V	20 A

- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW ON-VOLTAGE DROP (V<sub>cesat</sub>)
- LOW ON-LOSSES
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- OFF LOSSES INCLUDE TAIL CURRENT
- VERY HIGH FREQUENCY OPERATION
- SHORT CIRCUIT RATED
- LATCH CURRENT FREE OPERATION



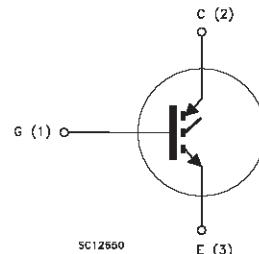
#### DESCRIPTION

Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding performances. The suffix "K" identifies a family optimized for high frequency motor control applications with short circuit withstand capability.

#### APPLICATIONS

- HIGH FREQUENCY MOTOR CONTROLS
- U.P.S.
- WELDING EQUIPMENTS

#### INTERNAL SCHEMATIC DIAGRAM



#### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CES</sub>	Collector-Emitter Voltage (V <sub>GS</sub> = 0)	600	V
V <sub>EGR</sub>	Emitter-Collector Voltage	20	V
V <sub>GE</sub>	Gate-Emitter Voltage	±20	V
I <sub>C</sub>	Collector Current (continuos) at T <sub>C</sub> = 25°C	40	A
I <sub>C</sub>	Collector Current (continuos) at T <sub>C</sub> = 100°C	20	A
I <sub>CM</sub> (■)	Collector Current (pulsed)	80	A
T <sub>sc</sub>	Short Circuit Withstand	10	μs
P <sub>TOT</sub>	Total Dissipation at T <sub>C</sub> = 25°C	125	W
	Derating Factor	1	W/°C
T <sub>stg</sub>	Storage Temperature	-65 to 150	°C
T <sub>j</sub>	Max. Operating Junction Temperature	150	°C

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### THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	1.0	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W
Rthc-h	Thermal Resistance Case-heatsink Typ	0.5	°C/W

### ELECTRICAL CHARACTERISTICS (TCASE = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>BR(CES)</sub>	Collectro-Emitter Breakdown Voltage	I <sub>C</sub> = 250 μA, V <sub>GE</sub> = 0	600			V
I <sub>CES</sub>	Collector cut-off (V <sub>GE</sub> = 0)	V <sub>CE</sub> = Max Rating, T <sub>C</sub> = 25 °C V <sub>CE</sub> = Max Rating, T <sub>C</sub> = 125 °C			10 100	μA μA
I <sub>GES</sub>	Gate-Emitter Leakage Current (V <sub>CE</sub> = 0)	V <sub>GE</sub> = ±20V , V <sub>CE</sub> = 0			±100	nA

### ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>GE(th)</sub>	Gate Threshold Voltage	V <sub>CE</sub> = V <sub>GE</sub> , I <sub>C</sub> = 250μA	5		7	V
V <sub>CE(sat)</sub>	Collector-Emitter Saturation Voltage	V <sub>GE</sub> = 15V, I <sub>C</sub> = 20 A V <sub>GE</sub> = 15V, I <sub>C</sub> = 20 A, T <sub>j</sub> =125°C		2.3 1.9	2.8	V V

### DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub>	Forward Transconductance	V <sub>CE</sub> = 25 V , I <sub>C</sub> =20 A		8		S
C <sub>ies</sub>	Input Capacitance			1300		pF
C <sub>oes</sub>	Output Capacitance	V <sub>CE</sub> = 25V, f = 1 MHz, V <sub>GE</sub> = 0		200		pF
C <sub>res</sub>	Reverse Transfer Capacitance			30		pF
Q <sub>g</sub>	Total Gate Charge	V <sub>CE</sub> = 480V, I <sub>C</sub> = 20 A, V <sub>GE</sub> = 15V		90		nC
Q <sub>ge</sub>	Gate-Emitter Charge			T.B.D.		nC
Q <sub>gc</sub>	Gate-Collector Charge			T.B.D.		nC
t <sub>wsc</sub>	Short Circuit Withstand Time	V <sub>ce</sub> = 0.5 BVces , V <sub>GE</sub> = 15 V, T <sub>j</sub> = 125°C , R <sub>G</sub> = 10 Ω	10			μs

### SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>CC</sub> = 480 V, I <sub>C</sub> = 20 A		20		ns
t <sub>r</sub>	Rise Time	R <sub>G</sub> = 10Ω , V <sub>GE</sub> = 15 V		70		ns
(di/dt) <sub>on</sub>	Turn-on Current Slope	V <sub>CC</sub> = 480 V, I <sub>C</sub> = 20 A R <sub>G</sub> =10Ω V <sub>GE</sub> = 15 V,T <sub>j</sub> = 125°C		350		A/μs
E <sub>on</sub>	Turn-on Switching Losses			300		μJ

**ELECTRICAL CHARACTERISTICS (CONTINUED)****SWITCHING OFF**

<b>Symbol</b>	<b>Parameter</b>	<b>Test Conditions</b>	<b>Min.</b>	<b>Typ.</b>	<b>Max.</b>	<b>Unit</b>
$t_c$	Cross-over Time			120		ns
$t_r(V_{off})$	Off Voltage Rise Time			35		ns
$t_d(off)$	Delay Time	$V_{cc} = 480 \text{ V}, I_C = 20 \text{ A}, R_{GE} = 10 \Omega, V_{GE} = 15 \text{ V}$		130		ns
$t_f$	Fall Time			80		ns
$E_{off}(**)$	Turn-off Switching Loss			0.45		mJ
$E_{ts}$	Total Switching Loss			0.6		mJ
$t_c$	Cross-over Time			190		ns
$t_r(V_{off})$	Off Voltage Rise Time	$V_{cc} = 480 \text{ V}, I_C = 20 \text{ A}, R_{GE} = 10 \Omega, V_{GE} = 15 \text{ V}$		55		ns
$t_d(off)$	Delay Time	$T_j = 125 \text{ }^{\circ}\text{C}$		160		ns
$t_f$	Fall Time			150		ns
$E_{off}(**)$	Turn-off Switching Loss			0.75		mJ
$E_{ts}$	Total Switching Loss			1.05		mJ

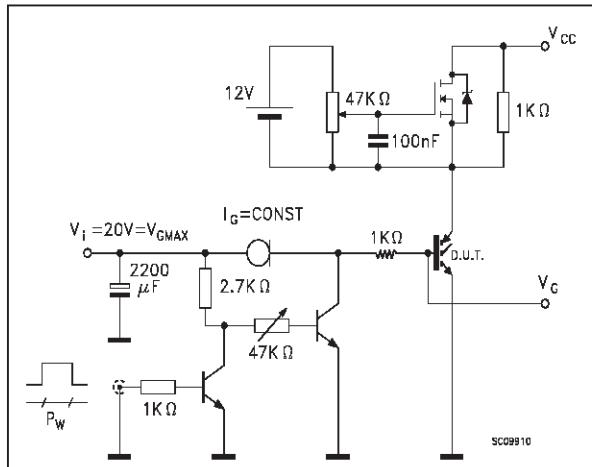
Note: 1. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.

2. Pulse width limited by max. junction temperature.

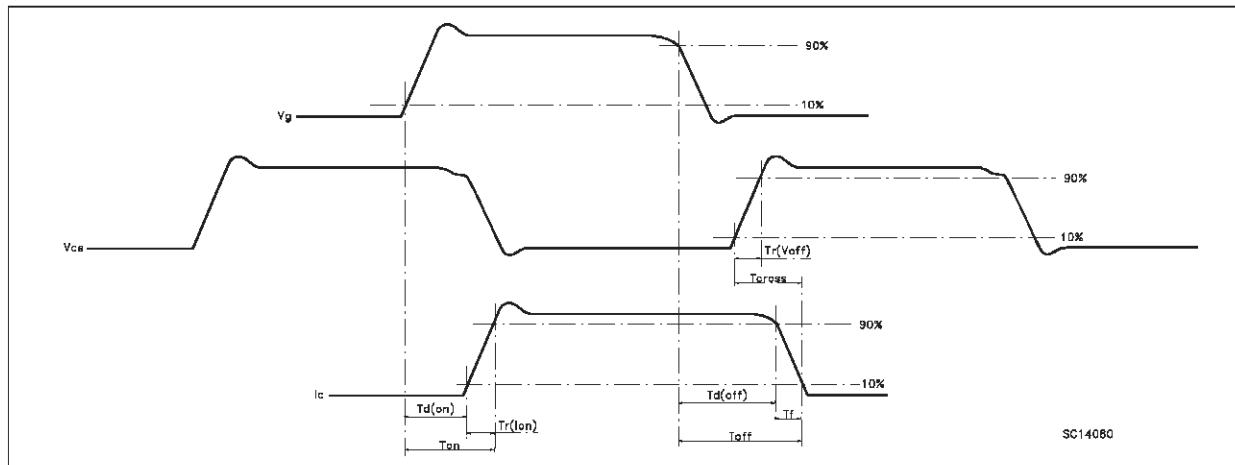
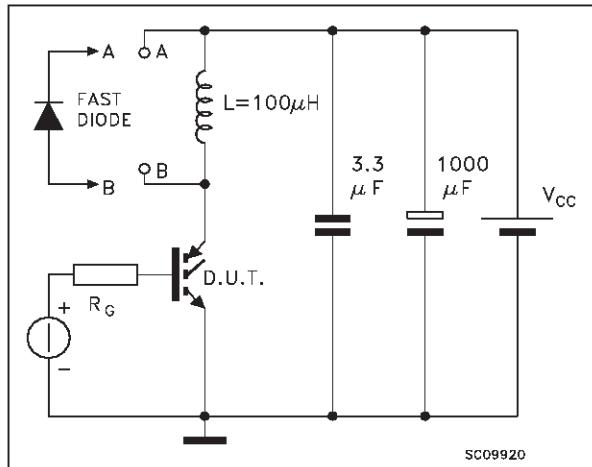
(\*\*)Losses include Also the Tail (Jedec Standardization)

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**Fig. 1: Gate Charge test Circuit**

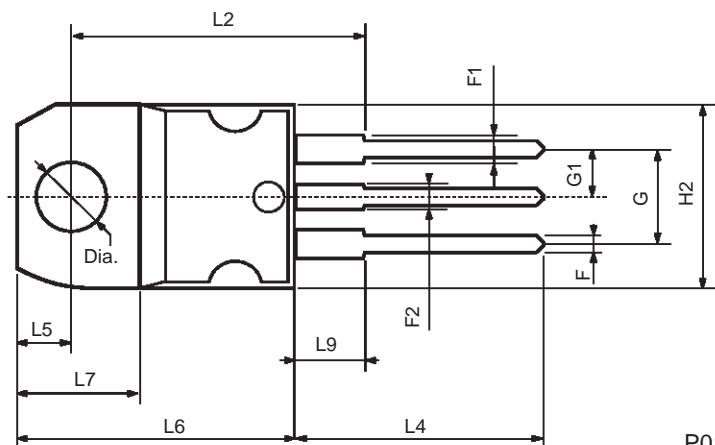
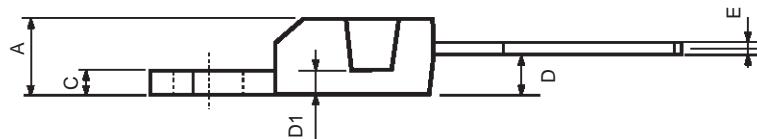


**Fig. 2: Test Circuit For Inductive Load Switching**



## TO-220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



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